Title: Room for Every Bird

Brief Overview:

In this activity, students will research birds indigenous to their area. Next they will choose a birdhouse kit from the recommended website. The students will use area formulas and calculations to find the surface area of their birdhouse and create a scale drawing of the pieces of their birdhouse. The final product will be a written summary of their calculations, drawings and an estimate of paint needed to cover all the birdhouses in the class.

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NCTM Content Standard/National Science Education Standard:

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Use visualization, spatial reasoning, and geometric modeling to solve problems
- Understand measurable attributes of objects and the units, systems, and processes of measurement
- Apply appropriate techniques, tools, and formulas to determine measurements
- solve problems that arise in mathematics and in other contexts
- apply and adapt a variety of appropriate strategies to solve problems
- organize and consolidate their mathematical thinking through communication
- use the language of mathematics to express mathematical ideas precisely
- understand how mathematical ideas interconnect and build on one another to produce a coherent whole
- recognize and apply mathematics in contexts outside of mathematics
- select, apply, and translate among mathematical representations to solve problems
- use representations to model and interpret physical, social, and mathematical phenomena

Grade/Level:

Grade 6

Duration/Length:

Five 80 – minute class periods

Student Outcomes:

Students will:

- Use formulas to calculate area of triangles, quadrilaterals, and circles
- Accurately measure using metric units
- Determine surface area of exterior of birdhouse

- Complete scale drawing of pieces of birdhouse
- Share a written explanation of finished project

Materials and Resources:

- Centimeter graph paper
- Centimeter ruler
- Birdhouse kits
- Paint
- Paintbrushes
- Access to the following websites:
    - www.craftkitsandsupplies.com
    - http://www.regentsprep.org/regents/math/scale/Lscale.htm
    - http://www.regentsprep.org/regents/math/scale/Lscale.htm
    - http://www.mathsisfun.com/definitions/scale-drawing.html
    - http://www.wildbirds.com/FindBirds/StatebyStateInformation/EasternUSStates/MarylandBirding/tabid/146/Default.aspx
    - http://www.craftkitsandsupplies.com/bird-houses-bird-house-kits-c-69_70.html
- Copies of Worksheets
    - Area Pre-Assessment
    - Rubric for Final Assessment
    - Formula Reference Sheet
    - Analyzing Area Homework
    - A Room for Every Bird Final Assessment

Development/Procedures:

Day 1

- Pre-assessment
  Give the worksheet, "Area Pre-Assessment", which will assess prior knowledge of area of quadrilaterals, triangles, and circles.

  To refresh students memories with scale factors and drawings, students will visit the following websites and practice scale factors:
  http://www.regentsprep.org/regents/math/scale/Lscale.htm
  http://www.regentsprep.org/regents/math/scale/Lscale.htm
  http://www.mathsisfun.com/definitions/scale-drawing.html

- Explanation
  The overall purpose of the activity is to relearn the area formulas for geometric shapes and to then the teacher through direct instruction will explain the concept of surface area to the students. Students will then find the surface area of objects in the classroom (tissue box, wooden dowel, etc.).

- Exploration

  In this first day, students will explore the concept of surface area. After reviewing the area formulas, the teacher, through direct instruction will explain surface area. Then the students will explore the concept on their own by finding the surface area of objects in the classroom. (Tissue box, cereal box, cylindrical oatmeal box, etc.)

- Application
  Hand out three-dimensional shapes to measure surface area, such as a tissue box, a cereal box, a wooden dowel, and a triangular prism. Have the students measure and calculate surface area of each three dimensional object. Hand out the Maryland State Board of Education Geometry Formula reference sheet found at mdk12.org/instruction/curriculum/has/geometry/math_reference_sheet.html.

- Exploration
  Hand out birdhouse kits to the students, along with metric rulers and centimeter graph paper. Students can work in pairs if the teacher feels this would help those students who may find this activity difficult.
  Instruct the students to determine the scale for drawing of each piece to fit on one sheet of centimeter graph paper. Be sure the students draw all pieces of the birdhouses on one piece of graph paper.

- Assessment
  Assess the students by walking around room and answering questions and observing students' interactions. Collect the scale drawings.

Day 3

- Exploration
  Instruct the students to calculate the surface area of their birdhouses using formula sheet given out on day 2. Calculate the amount of paint needed for entire class to paint all birdhouses. Have the students discover that cans of paint specify coverage total on the label, which is the total surface area the can will cover.

  Collect surface area calculations if completed.

- Explanation
  The teacher, through direct instruction, will take the paint can and explain to the students what the coverage number means on the paint can. Next, the students will calculate the surface area of their birdhouses from the

drawings they made the day before. Next, the students will decide how much paint they need to paint their bird houses.

- Application
  The teacher needs to have the cans of paint on hand for the students to use. The students will finish their total surface area calculations and then use the paint cans to determine how much paint they need.

- Differentiation

  For students with special needs, the teacher can take the coverage numbers from the cans and write them on the board so the students do not need to handle or read the cans.

Day 4

Birdhouses will be assembled and painted on this day.

Homework: Students will write in their math journal about what they have accomplished and learned so far in this unit.

- Exploration/Explanation
  On the final day, the students will be able to assemble the birdhouses and paint them. They will be able to see that mathematics has a purpose in everyday life and activities. They will discover whether or not their calculations for the amount of paint needed were correct. They will discover whether they have enough paint or too much paint.

  The teacher may need parent volunteers or other aides in the classroom during this hands on activity. It could also be completed after school.

  The students will first assemble the bird houses. When they need paint, they will only take as much as their calculations (from the previous day) recommended. If the students run out of paint, they can see the teacher for more but they must explain why to the teacher. (They need to articulate that their calculations were wrong and thus they need more paint)

  After the assembling and painting are completed, the students will write in their math journal. They will answer the questions: “How did you apply the mathematical concept of surface area to our birdhouse project? Why was it necessary to have correct calculations?”

- Application

In this activity, the students are applying the surface area calculations from the previous day and applying them to their real-world project of building and painting a bird house.

- Differentiation
  If there are special needs students, the teacher can have aides or parent volunteers assemble the bird house. The students can just paint it.

Summative Assessment:

The summative assessment for this unit will be the "A Room for Every Bird" written assignment. This will be completed in class on the last day. Students will follow the rubric handed out on the first day. The students will then share their conclusions with the class.

Authors:

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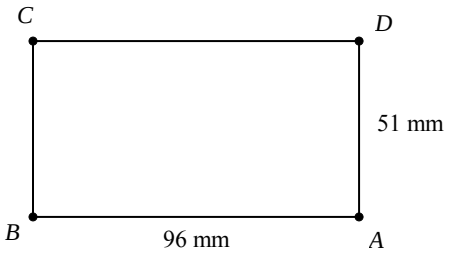
Area Pre-Assessment Name: _____

Directions: For exercises 1 – 8, find the area. Round answers to the nearest tenth.

1.



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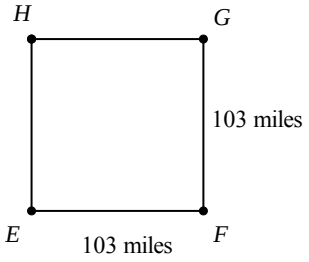

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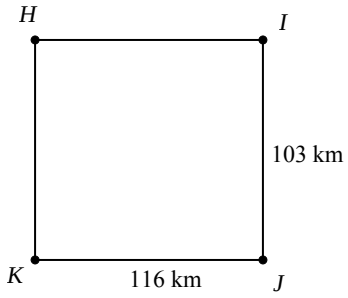

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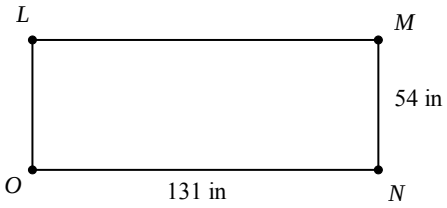

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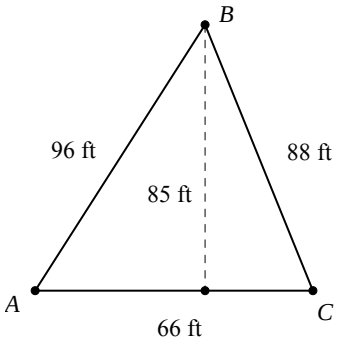

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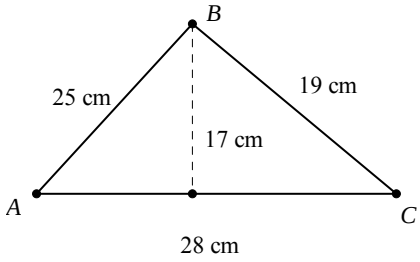

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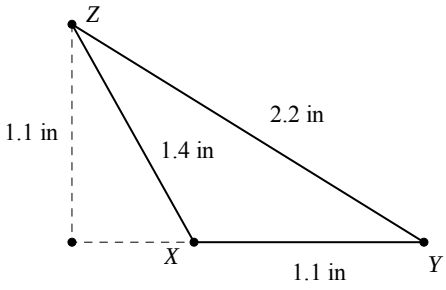

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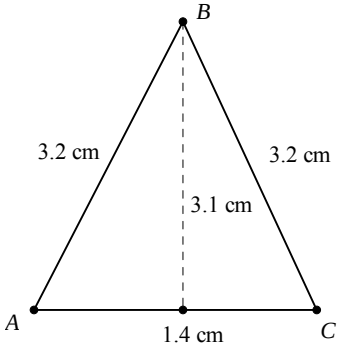
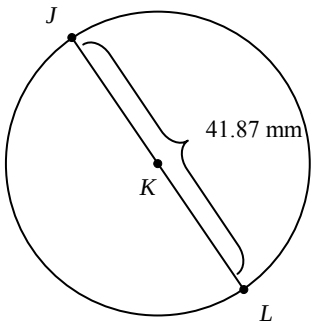


Directions: Find the area of each circle. Use $\pi \approx 3.14$.

9.



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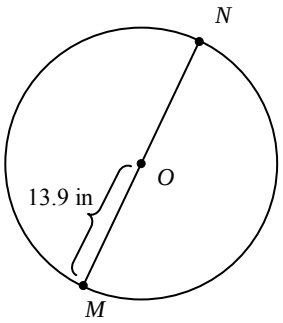

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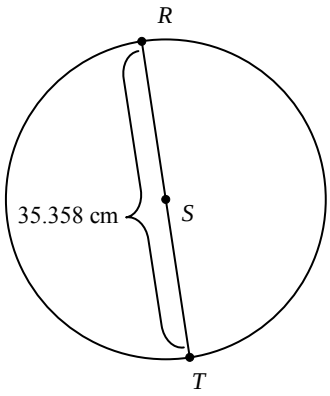

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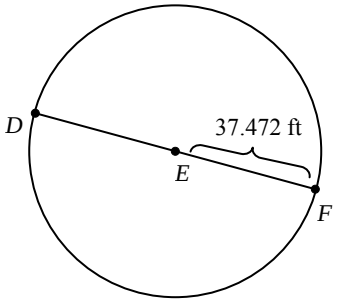
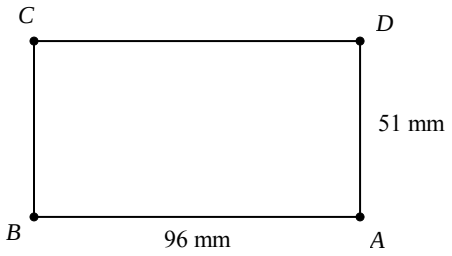


Area Pre-Assessment Name: __ANSWER KEY___

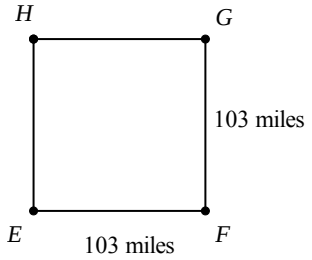
Directions: For exercises 1 – 8, find the area. Round answers to the nearest tenth.

1.



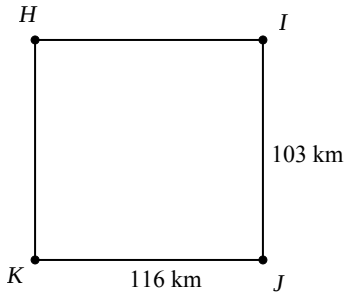
4896 mm^2

2.



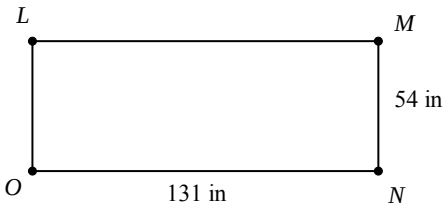
10609 square miles

3.



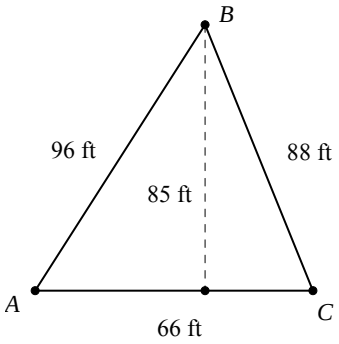
11948 mk^2

4.



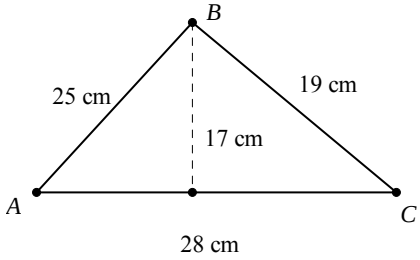
7074 in^2

5.



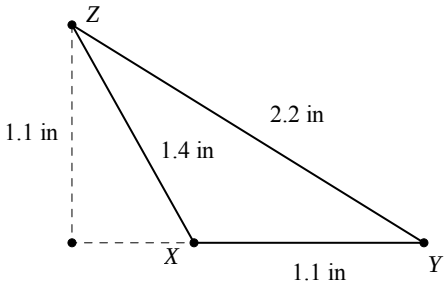
2805 ft^2

6.



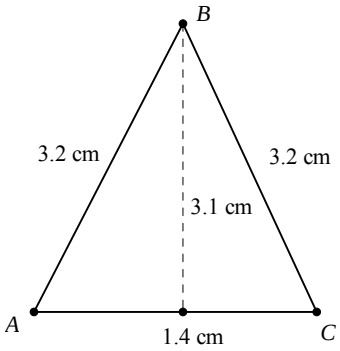
238 cm^2

7.



0.6 in^2

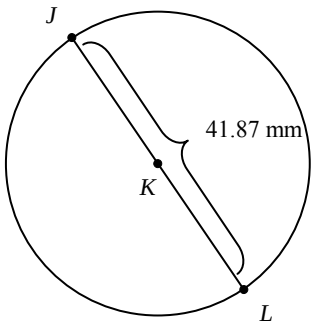
8.



2.2 cm^2

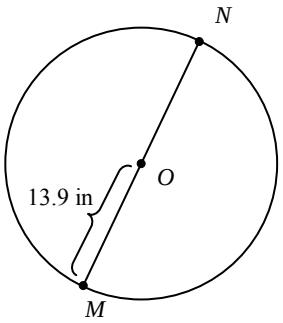
Directions: Find the area of each circle. Use $\pi \approx 3.14$.

9.



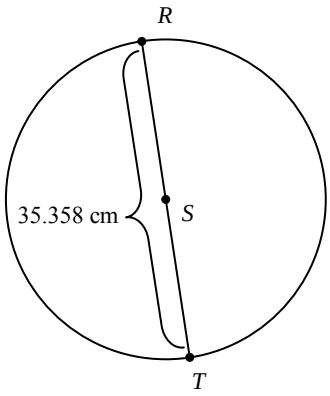
1376.2 mm^2

10.



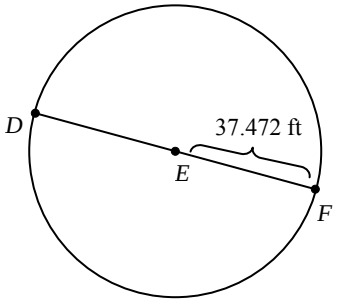
606.7 in^2

11.



981.4 cm^2

12.

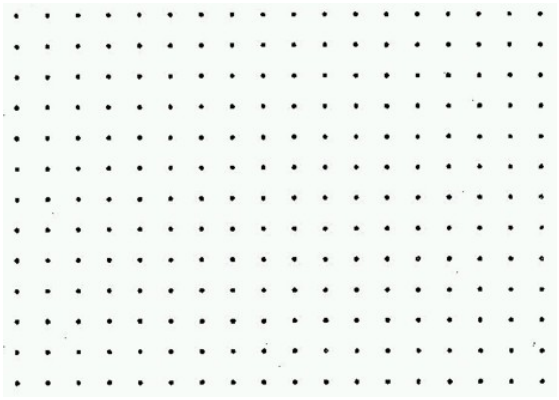


4409 ft^2

Analyzing Area Name: _____

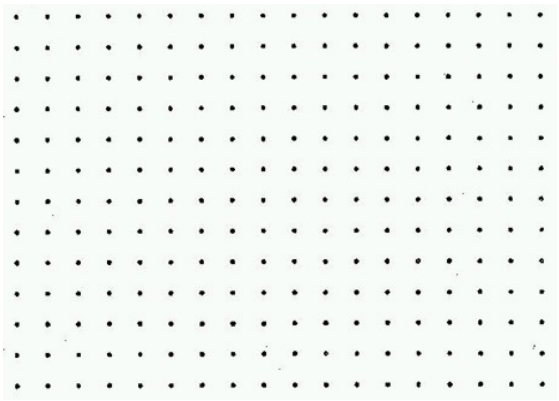
Directions: On each grid, draw the polygon and find its area.

1. Rectangle: 8 units by 5 units



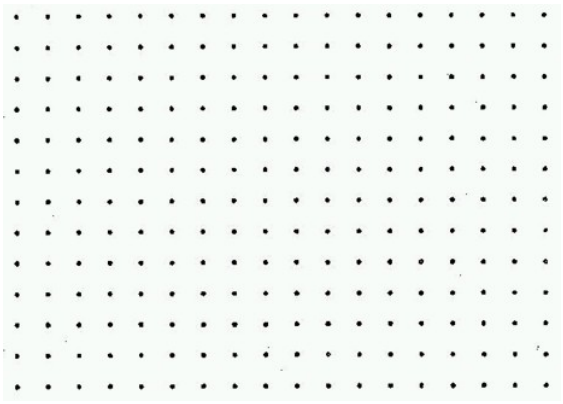
Area = _____

2. Square: 7 units by 7 units



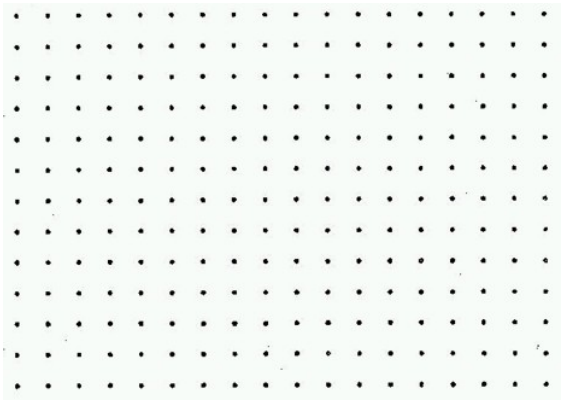
Area = _____

3. Triangle: base of 8 units and a height of 6 units.



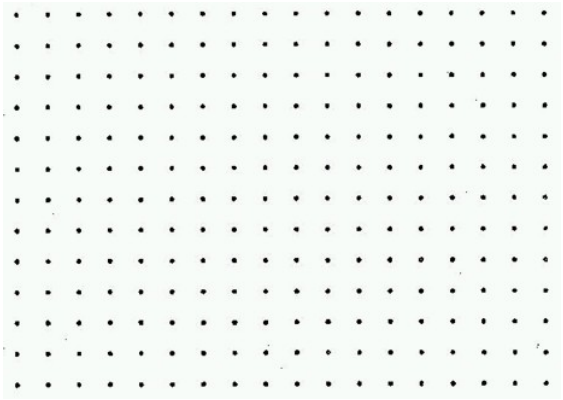
Area = _____

4. Circle: radius of 3 units. Use 3.14 as π



Area = _____

5. Create your own polygon on the dot grid and find its area.

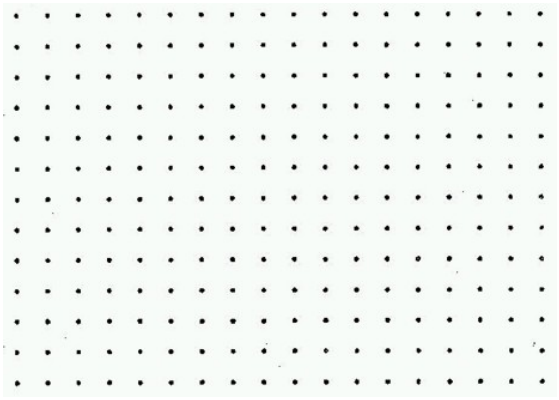


Area = _____

Analyzing Area Name: _____

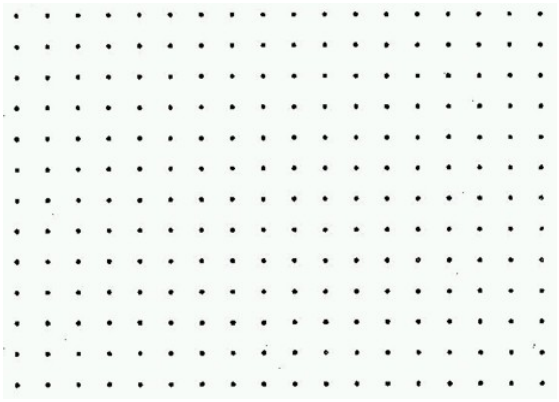
Directions: On each grid, draw the polygon and find its area.

1. Rectangle: 8 units by 5 units



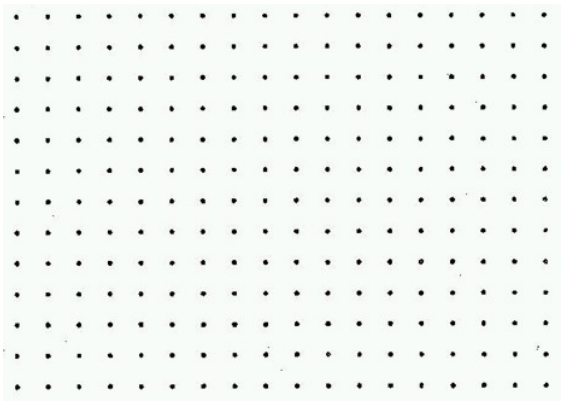
Area = 40 units²

2. Square: 7 units by 7 units



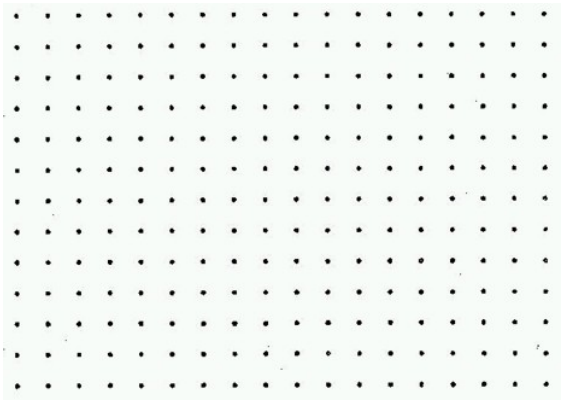
Area = 49 units²

3. Triangle: base of 8 units and a height of 6 units.



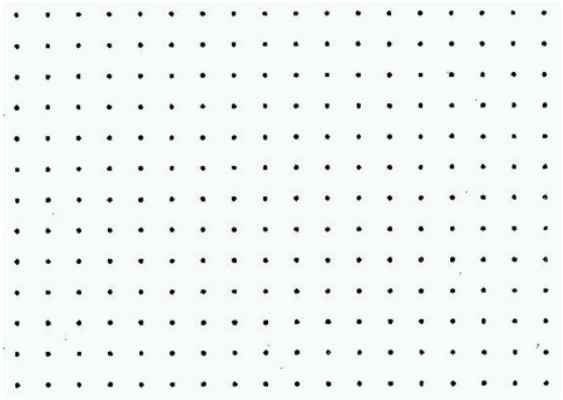
Area = 24 units²

5. Circle: radius of 3 units. Use 3.14 as π



Area = 28.26 units²

5. Create your own polygon on the dot grid and find its area.



Area = See student work

A Room for Every Bird Name: _____
Final Assessment

In your own words, describe the steps you would need to take to find the surface area of this birdhouse. Be sure to include all the sides and subtract the opening. Don't forget your unit of measurement. You have 30 minutes for this assessment and you may use the back of this paper.

Rubric for Final Assessment

4 Points

- Accuracy-All calculations correct
- Legible
- Scale factor and drawings to the right proportion
- Estimation for classroom total paint correct

3 Points

- Accuracy-within range of whole numbers
- Legible
- Scale factor and drawings to right proportion and within range of whole numbers
- Estimation for classroom total within range of whole numbers

2 Points

- Majority of calculations correct
- Legibility needs improvement
- Scale factor and drawings are there but not correct
- Estimation of paint not submitted

1 Point

- Some calculations but not many correct
- Illegible
- Drawings incomplete or missing
- Estimation of paint not submitted

0 Points

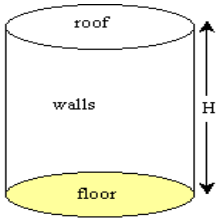
- Paper not completed or handed in.

Insert as reference sheet:

Mdk12.org/instruction/curriculum/has/geometry/math_reference_sheet.html

Surface Area of a Cylinder

(H is the height of the cylinder; r is the radius of the top circle)



A cylinder has a circle of the top and bottom and each area needs to be found by the formula:

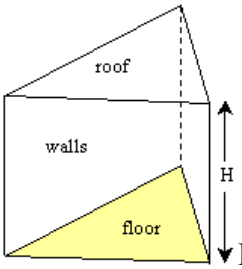
Area of a circle = πr^2, where π = 3.14 and r = radius. Remember there is a top and bottom circle

Surface Area of sides of cylinder would equal perimeter of top times the height.

Formula for the surface area of a cylinder would be;

Surface Area = $2(\pi r^2) + (2\pi r)*h$, where, π= 3.14, r = radius, and h = height.

Surface Area of a Triangular based prism



Floor and Roof are triangles using the formula:

Triangle Area = ½(bh)

Rectangular (side) Area = bh

Total Surface Area = $bh + (S_1 + S_2 + S_3)h$

Don't forget your units of measurement!!

Area is always units squared, such as 36 in².